

Seismic rate changes associated with seasonal, annual, and decadal changes in the cryosphere.

Near the Bering Glacier Global Fiducial site in southern Alaska large cryospheric fluctuations occur in a region of upper crustal faulting and folding associated with collision and accretion of the Yakutat terrane. In this study we report constraints on seasonal, annual and decadal cryospheric changes estimated over the last decade from field, aircraft and satellite measurements, and we evaluate the influence of cryospheric changes on the background seismic rate. Multi-year images from the Bering Glacier global fiducial site are available since mid-2003 to constrain changes in extent of the Bering Glacier and to discern feature changes in the glacial surface. Starting around the same time, satellite gravimetric measurements from the Gravity Recovery and Climate experiment (GRACE) commenced. Large spatial-scale mass change calculated from the GRACE $1^\circ \times 1^\circ$ mascon solution of Luthcke et al. [2012] indicate a general trend of annual ice mass loss for southern Alaska but with large, variable seasonal mass fluctuations. Since 2007, the station position of a continuous GPS site near Cape Yakataga (Alaska EarthScope PBO site, AB35) has been available as well. In addition to changes in the geodetic position due to tectonic motion, this GPS station shows large seasonal excursions in the detrended vertical and horizontal position components consistent with snow loading in the fall and winter and melt onset/mass decrease in the spring/summer. To better understand the timing of processes responsible for the onset of cryospheric mass loss documented in the GRACE data, we examined changes in the snow cover extent and the onset of melt in the spring. We calculated the surface displacements of the solid Earth and theoretical earthquake failure criteria associated with these annual and seasonal ice and snow changes using layered elastic half-space. Additionally, we compared the seismic rate ($M > 1.8$) from a reference background time period against other time periods with variable ice or tectonic change characteristics to test the significance of seismic rate changes. Our earlier results suggest statistically significant changes in the background seismic rate associated with large seasonal mass changes.

INDEX TERMS: [1223] GEODESY AND GRAVITY / Ocean/Earth/atmosphere/hydrosphere/cryosphere interactions, [4321] NATURAL HAZARDS / Climate impact, [8118] TECTONOPHYSICS / Dynamics and mechanics of faulting, [8104] TECTONOPHYSICS / Continental margins: convergent. (No Table Selected) (No Image Selected)
Sponsor **SPONSOR NAME:** Jeanne Sauber **SPONSOR EMAIL ADDRESS:** Jeanne.M.Sauber-Rosenberg@nasa.gov **SPONSOR MEMBER ID:** 10189073
Additional Details Previously Presented Material: 40% Fall AGU